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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/728,699 | 12/05/2003 | Young-Hun Seo | OPP 031052 US | 9947 |
| 36872 | 7590 | 06/02/2005 | EXAMINER | |
| THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C. 7257 N. MAPLE AVENUE BLDG. D, 3107 FRESNO, CA 93720 | | | VU, DAVID | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2818 | |

DATE MAILED: 06/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/728,699

Applicant(s)

SEO, YOUNG-HUN

Examiner

DAVID VU

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 9 and 16-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-15 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "removing the remaining region of the LOCOS oxide layer and forming a liner oxide layer prior to forming the insulation layer" must be shown or the features canceled from the claims. No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 5, 7, 11-15 and 21 are rejected under 35 U. S. C. 102(b) as being anticipated by Jang (US Pat. 5,910,018).

Regarding claims 1, 2, 5, 7, 11-15 and 21, Jang discloses a method of forming a trench in a semiconductor device, comprising: forming a pad oxide layer 12 on the silicon wafer (col. 2,

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lines 53-54); forming a sacrificial layer (nitride layer 14) has a thickness of about 1000-4000 Å (col. 2, lines 54-55) on a pad oxide layer 12 and selectively etching the sacrificial layer 14 to form a LOCOS opening having a predetermined width (col. 3, line 62 through col. 4, line 7); performing thermal oxidation on a portion of the silicon wafer exposed through the LOCOS opening to form a LOCOS oxide layer 28 (figs. 1-4 and col. 3, lines 18-26); etching the LOCOS oxide layer 28 and the silicon wafer to a desired depth to form a trench (col. 3, lines 27-41), the etching being performed such that the LOCOS oxide layer 28 is left remaining on the silicon wafer at an area corresponding to edges of the trench (at some point during the etch process); removing the remaining region of the LOCOS oxide layer (fig. 5) and forming a liner oxide layer 29 prior to forming the insulation layer 30 and forming an insulation layer 30 such that the trench 50 is filled with a material of the insulation layer 30 (figs. 7-9); performing chemical-mechanical polishing on the insulation layer 30 until the sacrificial layer 14 is exposed (fig. 8 and col. 3, lines 54-60).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 3, 4, 6, 8 and 10 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Liu et al. (US Pat. 6,184,105, herein after Liu).

Liu discloses a method of forming a trench in a semiconductor device but fails to disclose the sacrificial layer is etched to a width of 50-500Å (claim 3); the sacrificial layer is etched having a width that is at most 400Å greater than the trench (claim 4); or at most 200Å of a width of the LOCOS oxide layer positioned at edges of the trench is covered such that at most 400Å of an entire cross-sectional width is covered (claim 6); and the liner oxide layer is formed to a thickness of 100-500 Å (claims 8 and 10). Although the exact width of the trench and the thickness of the liner oxide was not specified as recited in claims 3, 4, 6, 8 and 10, it appears that having a specific width and thickness as claimed is prima facie obvious due to the fact that one can vary the width and thickness in order to achieve a specific trench dimension in a semiconductor device. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of Liu by selecting a suitable width and thickness, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Moreover, as the width of the trench and the thickness of the oxide liner does seem to be critical to the invention, it must be shown that any one or all of the listed materials yield an unexpected product or result. In re Margolis 228 USPQ 940 (Fed. Cir. 1986); In re Kirsch 182 USPQ 286 (CCPA 1974); In re Suether 181 USPQ 36 (CCPA 1974); In re Costello 178 USPQ 290 (CCPA 1973); In re Von Schickh 150 USPQ 300 (CCPA 1966); In re Süssman 60 USPQ 538 (CCPA 1944); In re Kaplan 45 USPQ 175 (CCPA 1940).

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



David Vu